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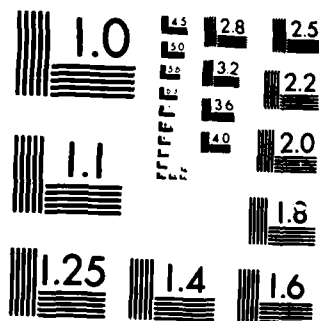
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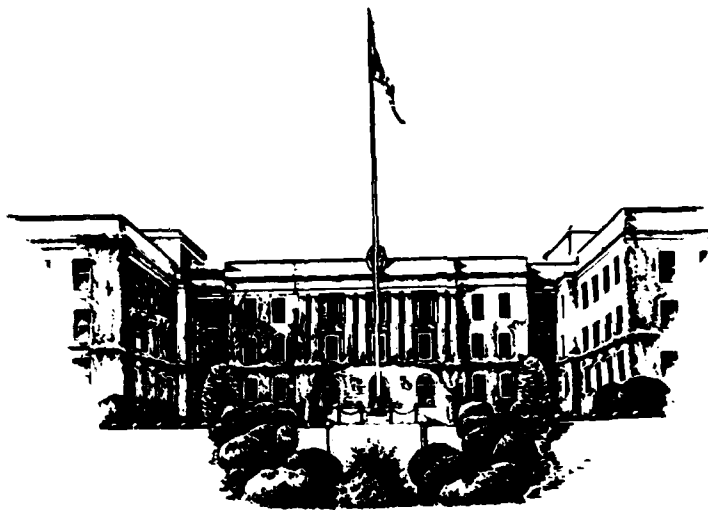


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Human Factors in Sustaining High Rates of Artillery Fire

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Report WRAIR NP-84-007

HUMAN FACTORS IN SUSTAINING HIGH RATES
OF ARTILLERY FIRE

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PREFACE

This paper is one of a series of occasional, informal accounts of work in the Division of Neuropsychiatry at the Walter Reed Army Institute of Research. The reports generally address topics in Army preventive medicine for which implementation responsibility lies significantly outside the Medical Department. Although their contents may overlap partly with our publications in the scientific literature, most papers are based on trip reports, briefings, and consultations involving specific Army audiences. Comments to the senior author are welcome.

This work was supported by Research Area III -- Health Hazards of Military Systems and Combat Operations -- of the U.S. Army Medical Research and Development Command; MG Garrison Rapmund, Commanding.

A short version of this report appeared in the September 1979 issue of Parameters under the title "Continuous Operations in Europe: Feasibility and the Effects of Leadership and Training."

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INTRODUCTION

This study originated with a July 1977 request from Commander, V Corps Artillery, to the Director, Walter Reed Army Institute of Research, for information bearing on the following three questions:

1. Can artillery crew members withstand physical stresses involved with handling large quantities of ammunition and firing at a high rate over a prolonged period?

2. What is the psychological impact of firing at high rates for prolonged periods? *not*

3. What leadership traits may be indicated as essential in accomplishing such a mission? *Leadership traits*

depression, morale - more of psychiatric casualties

Although V Corps was told that laboratory research suggested 36 hrs. as a good estimate of the time beyond which degraded performance will occur, more detailed investigation was requested. As a result, shortly after the establishment in USAREUR of the US Army Medical Research Unit, Europe (USAMRU-E), two staff members visited Grafenwoehr in February 1978 to view a cannon battalion ARTEP. Direct observations and informal interviews provided no compelling evidence to modify this guidance, but did serve to emphasize its tentative nature, based as it was on laboratory simulations and incomplete studies bearing, in some cases, little resemblance to actual FA operations. The Commander, USAMRU-E, accordingly suggested, in February 1978, a number of aspects of training, morale, and living and working conditions which might impact upon performance in prolonged, high intensity combat. Many of these, he suggested, could be assessed only by thorough familiarity with the day-to-day operations of an artillery battalion. Commander, V Corps Artillery therefore tasked one of his nuclear-capable 8-inch cannon battalions with supporting this familiarization process, though it was emphasized that USAMRU-E would visit only on an irregular basis, provide its own funding and transportation, and carefully avoid interference with the activities of the chosen unit. *social*

METHODS

In accordance with the conditions stated above, direct observation has been the primary means of data collection in this study. As noted below, this was supplemented not only by informal interviews with troops at breaks, meal-times, and after duty hours, but, in selected cases, with the full knowledge and consent of the affected chain of command, more formal interviews and questionnaires, as well as content analysis of documents, records, "third party" evaluations such as the AGI, and other written materials.

Initial contacts with the battalion were designed to introduce ourselves and our mission to the battalion, acquaint ourselves with the formal organization, equipment, and missions of the battalion, its recognized capabilities and deficiencies, and generate some testable hypotheses about the battalion's informal organization, everyday activities, unrecognized needs, goals and problems, and how these affect mission accomplishment. Our first visits with the battalion suggested that this would be best begun on a "target of opportunity" basis; that is, we attempted to introduce ourselves (MAJ Manning, SFC Petropulos, SP5 Kukura) throughout the battalion, at all levels of the organizational structure, explaining our mission in detail appropriate to the audience, and selecting the most receptive individuals for further semi-structured on-the-job interviewing. A second technique employed in this stage involving "tagging along" or "shadowing" an individual throughout a randomly chosen workday.

A total of 30 semi-structured interviews and "shadowings" were also conducted (by SP5 DeRouin) with a cross-section of wives of both officers and enlisted men, both command and non-command sponsored, on both first and subsequent tours, living in both American and economy housing. In a second phase of this community study, we attempted to get some appreciation for the range and depth of consumer services offered by the military community. Staff members visited such activities as the ACS, the AMEXCO banking facility, the Audio/Photo Club, bowling alleys, Education Center, gyms, libraries, medical and dental facilities, military clubs, nursery, Post Exchanges, and Quartermaster Clothing Sales Store. Both the physical state of these activities and customer service and satisfaction were noted by participant observation, "tagging along", and brief questioning of customers.

Important battalion events occurring during the period of our observations, May through November 1978, were an AGI; a two-week period during which elements of the battalion were tasked to support a National Guard unit in training in Grafenwoehr; the battalion's own two-week "summer Graf", culminating in an ARTEP in July. While at the latter site, largely through serendipity, we were able to make additional observations of the National Guard 8-inch battery, which was selected for training in Europe by virtue of superior CONUS performance, and of a 155 mm howitzer armored cavalry battery specifically tasked to maintain high rates of fire for a 12 hours period. Also covered by our observers were the annual Nuclear Surety Evaluation, Exercise Certain Shield (REFORGER '78), a battalion "ammunition upload", and the battalion's annual ARTEP evaluation of its firing batteries at Grafenwoehr ("winter Graf").

In the course of the six months' duration of this study, approximately 350 days of TDY were utilized for these observations. This report also incorporates relevant information gained through visits and correspondence from and to research colleagues in the US, Great Britain, Norway, Israel, and the FRG.

OBSERVATIONS

In preparing the report, it became obvious that many of our observations and conclusions were relevant to more than one of the questions originally posed to us (physical effects, psychological effects, leadership techniques required). As an alternative to repetition and/or artificially disentangling inherently related issues, we have chosen to present our findings under four functional headings: Fatigue and Performance; Neuropsychiatric Casualties; Training and Leadership; and Morale and Social Supports.

Fatigue and Performance

Nothing we have seen has undermined our laboratory and history derived assumption that psychological rather than physiological exhaustion is the critical problem in any

extended operation. That is, the question is not when do the men's muscles give out, but when does the will to continue give out (or when do they perform so badly they must be ordered to stop)? In practice, this means that the performance of decision-makers, such as the commanders and the battery XO's, and those whose jobs involve primarily cognitive skills, such as battalion staff, FDC members, survey sections, chief of firing battery, and communications equipment operators, will very likely be more susceptible to the stress of continuous high intensity combat than those with more labor-intensive jobs. Our own observations, particularly during battalion and battery evaluations at Grafenwoehr, and during REFORGER 78, suggest that a high proportion of artillery unit members can and will manage short naps even in conditions which would, a priori, be judged extremely unfavorable in terms of physical comfort and noise level. These naps ought to be encouraged by, and at, all levels of command. They are, however constantly undermined by the common myth that sleeping is unmanly. This is nowhere more established than among commanders themselves. The latter, although often in enthusiastic agreement about the necessity for sleep, quite often act as if they view sleep as a monk might view sex: a harmless enough activity for lesser men, and a good opportunity to exercise will power and demonstrate superiority through conspicuous self-denial. This is, of course, an over-simplification, but it must be emphasized that unlike physical laborers, whose work quantity is decreased by fatigue, decision makers and other mental laborers will have the quality of their work degraded. The latter, particularly when unrecognized or unacknowledged, is clearly the greater of the two evils.

Data from a variety of other sources support these assertions. For example, biochemical studies of a Special Forces "A" Team conducted by a WRAIR medical research unit during the Vietnam conflict found that with one exception, the officers showed both higher "resting" levels of 17-hydroxycorticosteroids (a classical indicator of stress), and a more pronounced elevation in response to the threat of an enemy attack on the camp. The one exception was the RTO, whose job, in terms of the types of demands placed upon him, and whose hormones were much closer to those of the officers than to those of the other enlisted men¹. An even earlier study of B-52 crews also found that leaders had much higher levels of this hormone².

Another WRAIR psychiatrist³ recently accompanied a Field Artillery battalion from Fort Sill to Germany as part

of REFORGER 78. Although this exercise was designed as a test of ability to deploy on short notice (96 hours), in practice the battalion had 2 months' notice, during which time they made extensive preparations. Among these were the identification of "non-deployables", and the request and receipt of 167 filler personnel from other battalions at Fort Sill. Despite this preparation, and what Dr. Belenky characterized as "the slow pace of events in Germany", the more senior officers and NCO's were sleeping very little during the FTX. He describes the situation thusly: "Tasks were delegated to the junior officers and junior non-commissioned officers, but often, responsibility was not. As a result, the more senior commissioned and non-commissioned officers would remain awake, often with little actual work to do, until all delegated tasks were completed." Belenky suggests that, as a result, these critical figures would have very little in reserve with which to handle the additional demands of actual combat³.

The Norwegian Defense Research Establishment has published several studies on the effects of prolonged severe physical work and sleep deprivation. A recent work⁴ reported on a group of 44 cadets of the Royal Norwegian Military Academy participating in a ranger training course demanding 8-10,000 kcal/day. One group was given no organized sleep for the five days of the course, while other groups got 3 and 6 hours of sleep respectively scheduled for the early morning hours of the third day. Each morning from 0630 to 0830, formal laboratory testing was conducted, using a variety of tests of both physical and mental functioning. While all the tests showed substantial and progressive decrements, of particular relevance here are the findings that a "coding" test requiring the subjects to substitute digits for symbols for 5 minutes, using a code unknown until the test, and a "command memory" test, in which cadets were given 2 minutes to memorize a standard military message, then asked to write it out an hour later after an especially strenuous physical task, were far and away the most sensitive. The average scores on both dipped to 65% of pre-course levels, and coding was significantly impaired after only 24 hours (command memory was not tested at 24 hours for some reason). By way of contrast, shooting (grouping at 25 meters) showed only a 10% impairment, and that not until the third day of the course.

Britain's Army Personnel Research Establishment (ARPE) has also conducted a number of experiments in the area of continuous operations, most notably Operations Early Call I

and Early Call II. These were nine-day tactical defensive exercises carried out by experienced infantry platoons. They were observed and rated continuously by both military and civilian scientists as well as infantry company commanders. In Early Call⁵, no sleep was scheduled for one platoon, only 90 minutes a night for a second platoon and 3 hours per night for a third. Military performance (shooting, weapon handling, digging, marching and patrolling) was assessed throughout, as well as performance on a battery of pencil and paper tests on such things as map reading, encoding and decoding, short-term memory, and logical reasoning. Results showed that the platoons became militarily ineffective after approximately 3, 6, and 9+ days respectively. Well-learned and mainly physical tasks were highly resistant to deterioration due to lack of sleep, but tasks with a cognitive or vigilance component were quite susceptible. A platoon of sleep-deprived soldiers were able to maintain their speed of march across country, to their ultimate detriment, since their platoon leader could no longer read his map properly. The formal testing basically confirmed this selective sensitivity, though map-reading was affected far less than logical reasoning and encoding and decoding. Follow-up studies have confirmed this, showing reduction to less than 50% of rested performance levels on these tests, with deterioration beginning after only one night without sleep. In addition, the occurrence of visual illusions was common enough that the study recommended posting sentries in pairs. On the positive side, as little as 3-4 hours unbroken sleep per night produced considerable improvements, both in military effectiveness and on the test batteries.

Even more germane to FA are the findings of a joint study by the US Army Research Institute of Environmental Medicine and the Walter Reed Army Institute of Research employing the FA fire direction center as a laboratory model for investigating effects of continuous operations. One aspect of their findings which particularly deserves amplification here concerns the marked difference in resilience to fatigue of forced-paced and self-paced activities. Briefly, five-man FDC's from the 82nd Airborne Division carried out an artillery combat scenario designed to simulate 86 hours continuous operations (sans actual movements). In fact, no team persisted more than 48 hours before opting to quit, though some were performing adequately at that time. In all cases, however a striking division of efforts appeared as time on task increased. Forced-paced activities, e.g., requests for fire from "forward observers" and "higher headquarters" consistently

produced well-trained, orderly, and appropriate reactions, though multiple simultaneous fire missions did cause some difficulties as time wore on; however, it became apparent that the "cost" of this performance was increasing neglect of self-paced activities like updating meteorological corrections, replotting targets relocated by survey or precision registrations, keeping the current tactical situation posted, plotting potential targets and "no fire zones," working up data for preplanned fires, updating records and logs, etc. This same distinction between forced-paced and self-paced activities can, of course, be applied to most other sections in a firing battery, and battalion headquarters as well, and the ARTEP performances we observed revealed similar patterns. For example, gun sections continued to deliver timely and accurate fire, but security declined as fatigue set in: camouflage nets set slowly or not at all, M60's not set up or not manned. Wire sections may get "hot lines" between FDC and guns in rapidly, but lines to perimeter and the switchboard may be omitted. Other examples will be apparent to the reader, and headquarters should certainly not be overlooked here, since good planning ought to be self-paced, rather than mere reaction to events.

A second important contribution of that study was the observation that the teams' lowest morale, poorest performance, and quitting invariably occurred between the hours of 0200 and 0600. This is consistent with a large literature on biological rhythms, but more importantly, it suggests that the staying power of the unit may well depend in large measure upon when hostilities begin. Assuming sufficient warning time for the battalion to meet the traditional dawn attack fully armed, deployed and rested, only 24 hours of fighting would carry the unit through this early morning trough, probably enabling it to function effectively throughout the following daylight hours (i.e., through 36 hours) at least. A 2100 hours attack, however, would bring the unit up to the difficult 0200-0600 interval for the second time after only 29 hours of fighting. A midnight attack lowers this to only 26 hours.

Further data could probably be assembled here, but it has been primarily these data, and our less formal observations of the same phenomena at work in field exercises which leaves us more convinced than ever that it is those in mentally, rather than physically, demanding jobs who are most at risk under conditions of acute sleep deprivation. Moreover, it is precisely these individuals, particularly the commanders, who most fervently believe themselves least

vulnerable, if not completely immune.

Perhaps closely related to this myth is what we have dubbed the "adrenalin theory". In brief, more than a few of our confidants have expressed the view that the increased excitement of actual combat will increase motivation sufficiently to produce all manner of previously unheard-of performances. Both lab studies and our observations counter this line of thought. First, although it is true that a moderate increase in arousal often facilitates performance, it is also true that beyond some optimal level, arousal tends to degrade performance. This "optimal level" very much depends upon the performance being considered, being very much lower for cognitive skills and decision-making than heavy labor. A homely analogy exists in professional football, where linemen are allegedly encouraged to raise their arousal level by chemical means, a technique so patently disastrous for a quarterback that it is not even considered. Secondly, even "continuous" operations will have some lulls, at which time we can expect a parasympathetic rebound. That is, the more intense the arousal during performance, the more powerfully will relaxation and fatigue dominate during lulls. This is obvious on a small scale during FTX's, and others have reported striking examples from combat. Paratroopers and amphibious personnel often experience a sense of relaxation upon making a safe landing so overwhelming that falling asleep is not unheard of⁶. Adrenalin is thus a very mixed blessing.

Neuropsychiatric Casualties

Approximately half a million men were separated from the American army between the years 1942 and 1945 for "emotional or mental reasons", a rate of about 50 per thousand enlisted males, despite the pre-induction rejection of nearly 1.7 million men (94 per 1,000) for these same reasons⁷. Granted that these overall statistics do not reflect the considerable improvements in prevention and treatment that took place by the end of the war, they also fail to reflect the considerably higher rates among troops actually in combat with the enemy. Appel⁸ reported an annual neuropsychiatric hospitalization rate for combat divisions in Europe of approximately 250 per 1,000, with infantry battalion rates going as high as 1,600 to 2,000 per 1,000 troops per year, for short periods of time. A good rule of thumb seems to be that psychiatric casualties

will occur in a ratio of about one for every four wounded in action.

In terms of traditional "combat fatigue", it might be assumed that 10 days is just too short a span to generate significant numbers. On the contrary! Many of the factors associated with high rates are present in current scenarios: intense fire, high casualty rates, retrograde movements, poor communications, and physical fatigue. In fact, the Israeli Defense Force reported that 10% of their casualties in the 1973 war that has served as a model for much recent US planning were what they termed "combat reactions". These were men who were found wandering around in a daze, or sitting quietly doing nothing, unresponsive to events and people around them. This is a rather low percentage of NP casualties, historically speaking, but it is the first war in which the IDF had any at all! Indeed more recent reports from Israel reveal that only extremely conservative criteria kept these initial estimates from reaching 25-35%. Post hoc studies of such casualties found that, although there was no "combat reaction personality", they tended to be older, married soldiers, and close to 80% had been undergoing some family and/or social crises (40% had had prior difficulties with peers or chain of command; 50% had had a baby or pregnancy, and 23% a death in the family within the previous year). How much higher these figures might have been without the mental health professionals the IDF routinely assigns down through the company level is impossible to say, but observers from our Medical Research and Development Command attending a large scale US field exercise recently held in the Fort Polk area suggest it might be very much higher indeed. Though they collected no hard data, a natural experiment emerged, since one of the divisions participating, and only one, made concerted efforts, via its mental health specialists, to seek out and help resolve troop concerns about dependent problems arising while the men were in the field, from physical safety to paying the phone bill. This division sent home for domestic problems only one-tenth the number sent back by their "opponents", the 82nd Airborne.

Some of the comments and recommendations made below under "Morale and Social Supports" will also be relevant here, and, in addition, our own modest surveys provided several observations. First, we have seen a steady increase in the number of married soldiers since the end of conscription. Recent policy changes insure that even the junior enlisted can have dependents flown to Europe as well. Second, European tours are now widely viewed as

hardship tours, particularly among the young marrieds. The old and typically crowded or non-existent military housing, frequent field exercises and a timidity about exploring the German community that borders on paranoia creates largely self-imposed but nevertheless real feelings of isolation and second class citizenship. US facilities like the PX and commissary were often cited as contributing to these feelings, not by virtue of physical inadequacies, as well they might, but due to "don't care" attitudes on the part of management and employees. Indeed, "no one really cares about my problems" was the single most common complaint we encountered. Paradoxically, the second most frequent complaint was "The Army has no right to tell me and my family who we should associate with or what we should be doing or not doing outside of duty". The Army thus finds itself damned as callous and unconcerned with pervasive loneliness, boredom and frustration, and damned again for its efforts to help, from Kontakt to coffee. The surprising number of senior NCO's electing to leave wife and family in the States for two years, as well as the dozen actively seeking out our observers for advice about marital problems, testifies to the real strain these feelings apparently produce. Third, current plans for non-combatant evacuation operations (NEO) are remarkable for their lack of credibility. An unspoken conspiracy of silence "protects" the wives, a large number of whom have never heard of NEO, but the most common response of males asked was, "Are you kidding? I don't know what I'd do if it came to that!" We don't find it hard to imagine after witnessing an E-6 slip home from REFORGER because his wife couldn't get to the commissary without him. Lastly, though no one innovation or renovation will cure this marital malaise, we found wives with paying jobs generally much more favorably disposed towards the Army, Germany, their community, and the demands made upon their husbands.

We suspect, on the basis of the frequent difficulty we encountered convincing commanders and supervisors at all levels that our interest in dependents' views did, in fact, have something to do with combat stress, that data such as that presented above needs much wider dissemination than it has received. Psychiatric casualties are too important to be left to psychiatrists.

Training and Leadership

Given the inherent limitation on live fire training imposed by the small number of training sites suitable for field artillery in West Germany, the units observed showed a high level of proficiency on their basic tasks. This should not, however, be construed to mean that training is currently optimal, or even adequate, for continuous operations. For example, it was obvious to even our non-technically trained observers that certain aspects of NBC training badly need increased emphasis.

To be specific, it is clear that the problems produced by a chemical environment are exacerbated by the heavy reliance of FA units on radio and telephone for normal functioning. Tanker's masks in particular often serve to eliminate the driver (often the gunner, when the piece is in position) and the track commander/gun section chief from telephonic or radio communications, turning the battery into a collection of manic relay races as runners shuttle data from FDC (or aiming circle) to guns and vice-versa. Unless men work in protective masks for extended durations, including processing of fire missions, emergency deployments and "hip shots", road marches, and occupations, even night occupations, this will continue to be seen as only a minor inconvenience rather than a potentially disastrous problem. A larger problem, of which this is a part, is that of instilling the idea that protective clothing, equipment, and techniques are intended to allow fighting a high intensity, mechanized, technological war while protected, rather than merely providing a purely defensive shell into which men and units crawl while the simulated "gas" blows away. A still larger problem, of which this in turn is a part, involves countering the fatalistic attitude toward NBC warfare which seems to characterize enlisted (and a surprising number of officers) approaches to NBC training. Interest in protective mask use and care is maintained rather well by the use of CS (twice a year at the MTA anyway), but persistent doubts about the effectiveness of other protective garments and procedures for testing and decontaminating undermines training in these areas and will only serve to make popular gloomy predictions self-fulfilling.

Beyond these suggestions for improvement in specific areas, some comments concerning the general training milieu are in order. Ignoring for the moment as uncorrectable the shortage of MTA time and ammo, the number of non-combat-

related requirements often discourages both commanders and men alike. Defensive driving, drownproofing, race relations, post police, hearing conservation classes, SOM boards, and partnership activities are all worthwhile programs, but when combined with physicals, photographs, hospital appointments, personnel record screenings, SDO, SDNCO, CQ, and support facilities open exactly the same hours as the duty day, it is not surprising that some see the tail as wagging the dog. Second, and more correctable, is the tendency (unquestionably produced by contingencies imposed from above) for many units to train for the next evaluation rather than for combat. While evaluation is a necessary concomitant of training, the same strained application of cost-effectiveness techniques which enshrined the body count in RVN acts now to stifle the very thing it is designed to measure. An extreme example is the expectation that a unit's vehicles achieve "zero defects". The only way to achieve such a goal is not to use them! Pressure for zero defects, in fact, produces a perverse sort of cross-training in which an altogether natural tendency of superiors to assume more and more of the duties of those under them provides a superficially acceptable quick-fix, but is actually destructive of team feeling. In addition, it soon leads to "burn-out" of intelligent, caring leaders who cannot do the jobs of 2-3 men indefinitely.

The importance of real cross-training, however, cannot be over-emphasized. First, because there are really only three general ways to extend unit performance: by use of medication to extend individual wakefulness, by letting subunits work to exhaustion and then replacing them, or by rotating subunits regularly between working and resting. The first of these alternatives may be unacceptable for a number of reasons, not the least of which is that all known stimulants capable of significantly countering physical fatigue invariably degrade the quality of intellectual (and high skill motor) performance. Both of the other alternatives demand cross-training. Secondly, the possibility of whole batteries being rendered ineffective by the loss to wounds or exhaustion of only a handful of men appears likely where some personnel are allowed to become indispensable by design or default. It will be impossible to survive extended operations if a unit insists upon maintaining the best man for the job in that position at all times. This appears to us to be most likely within the FDC and on the gun crews. We watched a FADAC operator, for example, drag his crutches and freshly cast leg into the back of a 577 with 5 other FDC members and struggle through a 36 hour battalion ARTEP "because he's far and away the

best FADAC operator in the battalion" (A significant side benefit here is that merely shifting jobs occasionally helps combat fatigue and maintain alertness, and it has also become apparent to us that cross-training in one or more related jobs can be an important morale booster in garrison).

None of this is news to any commander, so why should cross-training ever be slighted? The answer lies in current evaluation philosophy and technique, under which a commander is often well-advised to train one man to a high level of proficiency on a task rather than several men to a reasonably high level, even though it is apparent to all that the second course is more appropriate combat training. We witnessed, for example, the selection as leader of the special weapons convoy for the battalion nuclear surety evaluation the one officer in the battalion who had done it before, over the protests of two other battery commanders who argued that they should at least undergo the same training and rehearsal even if they did not formally represent the battalion for evaluation. The point here is not to hold up a particular commander or his staff for criticism. On the contrary, here and throughout the entire period of our study, this commander and his staff responded to the contingencies, the written and unwritten rules of the game, as any sensible man would. The outcome was often not sensible, however, because the present system of rewards in the Army focuses on short-term achievement to such an extent that it not only neglects long-term goals, but often encourages action directly counter to them.

Consider, for example, the experience of a young XO from a VII Corps 8-inch battery who chatted with us while serving as a REFORGER umpire. On their most recent field training, he explained, they had undertaken an 8-day exercise of their own devising in preparation for their battalion ARTEP:

"Everyone knows you can make it 36 hours. You may be screwed up by the time you finish, but you can do it. Eight days is something else, though - so we knew we'd have to devise some sort of shift schedule. It was tough at first, but by the end, we had it down pretty good. In fact, we were so pleased that when it came time for the ARTEP, which we knew would only be 36 hours at most, we figured, 'Hell, why not do it the way we'd have to do it in real combat, since we've got a system?' What do you suppose happens? We get gigged for 'lack of

enthusiasm', 'not going all out', and so forth when the evaluators see a bunch of people asleep."

As a start at reform, elimination of the adversary relationship between tester and testee, and the disproportionate importance attached to very specific and highly predictable tests, would allow for much more imaginative and combat-relevant testing, leading in turn to more well-rounded, combat-oriented, and morale-boosting training.

As for leadership, it is most appropriate to consider "sergeants' business"¹⁰ before wandering too far from the topic of training, for this is sergeants' business now more than ever. What concerns us here is not the young E-5 section chief, who by and large understands his role as teacher even if there are times when he doesn't have the expertise to do the job. We are concerned more by the seeming retreat from this role by the senior NCO's, who we heard many times decry the lack of skills amongst the section chiefs and acting E-5's. Their "solution" all too often was faith that MILPERCEN would soon send better material, a view that a two-year tour will certainly not discourage.

In terms of actual leader behavior during continuous operations, both the classic surveys of Stouffer et al.¹¹ and the recent experimental studies of the British point to the need for a more friendly and relaxed leadership style when dealing with tired soldiers. During Early Call, for example, NCO's reported that quiet reminders and exhortations were more effective than orders, particularly late in the Exercises. Tired soldiers tended toward passivity and docility rather than aggressiveness, resignation rather than resistance. This tendency held for leaders as well as followers, of course, and, in perfect harmony with the distinction made earlier between self-paced and forced-paced activities, a few of the junior NCO's in that study abdicated their positions of leadership in favor of personal survival and comfort.

Leadership of small groups may also find helpful several generalizations from studies¹² of civilian organizations performing under high task load:

1. There will be greater deviance from SOP and doctrine.

2. There will be increased prioritization (cf. self-versus forced-paced tasks).

3. Cross-checking will decrease.

4. Communications within the working group will decrease, as will record keeping.

5. Communications with "outside" groups and individuals will increase.

6. Decision-making initially centered on the formal leader will tend to be transferred to group members with greatest knowledge and experience if this is not the formal leader. If this is the formal leader, he will be relied on more and more for advice and decisions.

7. Interpersonal conflict will decrease (though positive interactions may not increase).

8. Attempts to briefly "leave the scene", physically or psychologically, will increase.

The demands upon leaders imposed by these alterations in group functioning will be obvious to the reader. Although we cannot offer further specifics at this time on leadership techniques in continuous operations, our observations have underlined for us several aspects of the current leadership "climate" that unquestionably impair the ability of today's Army to perform any kind of operations. Foremost among these is the strongly ingrained and widely held belief that mistakes are neither expected nor tolerated. The practical consequences of believing that one's career is at stake every minute of every day are parallel to those of the bodycount-like training atmosphere referred to above. As managers, we find it difficult to measure "taking care of one's men", instilling esprit-de-corps", "individual morale", and even "readiness", so instead we measure failures in these areas, on the assumption that these are merely the inverse. This assumption is simply not true; having few deserters does not equal having high morale, any more than lack of serious illness means being in good shape. Junior officers and senior NCO's particularly see their task as avoiding mistakes rather than learning and growing constantly by trial and error. Leadership cannot be learned this way. Thus we borrow a

philosophy from industry and commerce -- where there is a clear-cut dollar and cents product to serve as a counterbalancing positive goal -- and foolishly strip vehicles legitimately awaiting parts to make perfect those about to be inspected, or make sure the installation dining facility "belongs" to a unit not getting its AGI. Worse than merely teaching officers to avoid easily measured mistakes, this philosophy encourages them to falsify reports by omission or commission, to suppress initiative and honest communication, to assume subordinates' duties, or to shift work only to a dwindling number of "reliable" troops. This number is ever-dwindling because troops see this "reward system" all too clearly. It is also at least in part responsible for the flowering of what might be termed the "hardware store" approach to discipline and/or training problems: "I get no reward for the extra efforts involved in motivating or training these guys, so why not send them back like any other defective part, and get a brand new one?"

Is it any wonder, with this system of rewards, that officers are ambivalent about the traditionally and theoretically most honored of positions: commander? They see it as something to be endured for the sake of one's career rather than a highlight of that career. Those who have no taste or talent for command feel they must accept it, even seek it, to "remain competitive", while those who are good at it feel they too must move on to other jobs or wither on the promotion vine. Three recommendations are obvious here, two straightforward changes in policy, the other a more difficult change in attitude and philosophy, but all in need of implementation from the top downwards. The first is some change in promotion policy to eliminate the feeling that everyone must command at all levels. Second, we need some public acknowledgement that to err is human, that mistakes are a part of training despite a long range goal of perfection. Third, we need some positive real-time incentive for commanding to replace the current Holy Grail of secondary promotions up to Army Chief of Staff. Bonus pay, for example, combined with knowledge that a steady rise through the ranks is neither necessary for continued service nor dependent upon a succession of specified staff jobs, might be an inducement for high quality commanders to stay in positions where their accumulated skills would do the Army the most good.

Morale and Social Support Systems

Participants in a "Continuous Combat Workshop", sponsored by the US Army Concepts Analysis Agency in 1975, were asked to develop a list of "effectiveness measures or indicators which would provide a commander information about continuous combat feasibility." The panel, composed of both staff and invited authorities, military and civilian, gave "surprise potential" top rating, but "esprit" and "morale" followed closely in that order, well ahead of such factors as resupply rate capability, force ratio availability, night operations capability, and relative mobility.¹³ We thus feel we are at least not alone in suggesting, after Napoleon, that "in the end, the spirit will always conquer the sword."

Of special relevance to the area of morale in Germany is the persistent complaint from soldiers that "there's nothing to do here." Over the years USAREUR has made Herculean efforts to satisfy this seemingly unquenchable thirst for recreational programs and facilities. One reason the refrain persists may be due to lack of clarity about the sources of unhappiness, i.e. accepting too quickly and at face value the testimony of these young soldiers. Twenty-year olds, many of whom joined the Army to prove to family (and self) that they are now independent and capable adults, have a difficult time maintaining this conviction in a land where they cannot speak, read, or understand the language. Attempts to cope with this problem directly are themselves fraught with threats to self-esteem. As one soldier put it, "I tried to learn German from this lady friend of mine, but she just came right out and laughed when I messed up. No way I can take that!" An alternative to learning German is to take advantage of all that the US military community has to offer, but I suspect the need to finally be independent of mother's apron strings extends in many cases to Mother Army as well. The "barracks rat" thus hoards his boredom as a face-saving means of avoiding unnerving or frankly frightening situations on the one hand and forced adjustments to his chosen self-image on the other.

The "boredom" complaint of many in Germany was followed very closely in frequency, in our experience, by complaints about long hours and frequent field duty. On the face of it, the two could not be less related, nor could the answers -- more and better recreational facilities in the one case, and fewer and more simple tasks in

the other. We would be the last to discourage these changes, but are not convinced they would eliminate these two complaints, perhaps because the two seemingly contradictory complaints are, in fact, closely related to each other, and to the way the man's unit operates. For some, primarily the leaders, long hours mean hard work, sometimes because of reluctance or inability to share the load, for reasons cited above, sometimes simply because of the Army's propensity for paperwork. However, Starry¹⁰ reported recently on a TRADOC survey of time utilization by junior enlisted: half of the population surveyed said they spent 50% or more of every day doing nothing. Particularly while in the field, troops are acutely aware, and resentful, of time spent on activities for which a major field training area is unnecessary -- including recreation. In many respects, a three-week trip to Graf or perhaps a week at Graf each quarter, in which the battalion actually stayed in the field working an extended REFORGER-like problem might actually be better received than the present procedures. In garrison, a vicious circle often develops around the question of time off, which our observations suggest is the most potent single reinforcement available to commanders. All too often, however, the only consequence of rapid competent completion of a training or maintenance requirement is another assignment from a harried supervisor. Consciously or unconsciously, the troops react appropriately to a system in which rapid competent work has the same consequences for them as slow mediocre work -- they slow down and cut corners. The result is an even bigger backlog for the harried superior and the circle is underway. The solution implied here is, of course, more, not less, time off, but time off which is clearly contingent upon rapid competent work.

A final and most important confusion in the area of morale stems from the failure to distinguish individual or personal morale, which does indeed depend on things like good chow, clean clothes, recreational facilities, and so forth, from group and unit morale, a product of membership in a respected unit with confidence in and respect for comrades and leaders. ¹⁴ This is best illustrated by the treatment of drug and alcohol use, often considered a prime index of personal morale. First of all, drug and alcohol use must be recognized for what it is and what it is not. Most important in the present context is that it is not in itself likely to present serious problems during actual combat, since most current users are recreational users, not addicts. It is also not a sign of boredom, to be eliminated by more and better recreational facilities, nor

is it generally a disease, to be cured by mandatory weekly visits to a local medical facility. It is not a result of ignorance, to be remedied by a series of lectures or pamphlets. Lastly, the vast majority of users are not the innocent victims of an evil conspiracy of outside agitators. What it is, as Ingraham ¹⁵ puts it, is a way for soldiers to define group membership and achieve a sense of belonging in a very transient environment which stands apart from his previous social relations. Small group membership is crucial to the day-to-day experiences of the soldier. He is forced to manage large blocks of time away from his home, family and friends. That time needs to be filled in the company of other people, as he does not thrive in isolation.

Membership in certain groups comes naturally, by virtue of skin color, rank, or marital status. The average young barracks dweller can hardly join up with the one that appeals to him, however, and experience in past wars as well as industrial psychology has made it obvious to us that there is much to be gained if this company can be the soldier's work group. Thus, if the young soldier is to find a social support group for himself, it will have to be created by generating conversation and activities with the same limited and diverse group of other transients who comprise his work group. Moreover, he does not have much time to achieve this group identity, due to constant transfers and rotations, nor does he typically possess elaborate social skills or leisure time habits. Drug and alcohol use fit the bill perfectly here, offering a variety of distinct shared activities and unique group history that can create a sense of comradeship literally overnight and effortlessly. Further, periodic efforts to suppress use by search and seizure, health and welfare inspections, and urinalysis provide a real, defined threat that results in increased cohesion and solidarity among the "persecuted". Unfortunately, the social networks thus formed almost never include all members of a work group, and hardly ever include any significant mixture of ranks. In fact, drug use is most successful in setting off the first tour barracks dwellers from career-oriented soldiers. Both groups use the drug issue to organize their feelings of frustration and powerlessness toward each other. For the barracks dwellers, drug use expresses feelings, like "you have to either get high or go crazy to survive..." "Drug use serves exactly the same function for the careerists -- "What do you expect when all we have to work with are these ignorant potheads and junkies?" The corrosive effect upon discipline and unit cohesion should not be underestima-

ted. The attitude of distrust which comes to pervade relations between users and non-users is always maladaptive, and the hypocrisy of often hard-drinking supervisors pursuing drug users of another persuasion is not lost on any of the groups. (We watched respect for the whole chain-of-command steadily eroded by their inability or unwillingness to recognize the blatant alcoholism of one E-7, known as "Dingy Dan" behind his back. At the very end of our study, he was transferred out of the battalion -- to teach leadership in an NCO school!) Also obvious to all is the seeming impotence of their Army, beaten daily by the most junior of people in its efforts to suppress illicit drug use, not-so-subtly undermining respect for and confidence in the chain of command.

It follows that a successful prevention program would seek to provide alternatives for group identity and a sense of individual belonging focusing on destroying the present "we versus they" and creating identities where the "we" include both barracks dwellers and their leaders in opposition to a "they" external to the unit, preferably external to the company or battery.

This informal social bonding cannot be accomplished by orders and directives nor can it be given away. It must be built, as a by-product of activities which fill large blocks of time, involve minimal skill (so that anyone can participate) and specify some more or less well-defined "outsiders", or even better, opposition. The foregoing propositions suggest that intervention take the form of some group activity where the basic competitive unit is the work group within the company. A comprehensive sports program is one such activity. The object of such a program would be to encourage every member of the unit to compete in one team and one individual sport each week. Married soldiers and senior NCO's would compete on the same teams as the single soldiers, and perhaps dependents of unit members as well as soldiers. If the program were comprehensive enough so that everyone participated, between actual competition and practice, large blocks of time would be consumed in activities that would generate conversation among members of the unit, which, in turn, would provide alternative social alliances. This must be seen not as a troop welfare program, but as an essential part of the unit's mission, a part which will not only improve readiness by cutting into drug and alcohol abuse, but which will also provide the unit with its strongest weapon against the stress of combat: loyalty to one another.

CONCLUSIONS

Based on the observations and other sources cited above, our initial estimate of 36 hours continuous performance appears to be a reasonable guess at the endurance of a typical, Corps-level cannon battalion in the high intensity combat envisioned by V Corps staff. This should not be construed to mean that such battalions and all their subunits will perform flawlessly for a day and a half, nor that they will cease functioning altogether at that point. Indeed, serious, potentially fatal, deficiencies are likely after only 24 hours. Further, this interval should not be measured from the moment the unit begins to fire, but from the last opportunity to sleep prior to alert. On the other hand, there are a number of potentially controllable factors which might extend reliable performance to 60 or even 72 hours:

Sleep for Leaders

Sleep for leaders is by far the most critical of these, due to the high sensitivity of decision-making and other cognitive tasks to fatigue. At present, this fact is simply unacceptable to the vast majority of leaders at battalion and lower levels, at least with regard to themselves.

Cross-Training

Cross-training is essential at all levels, command included, if any kind of shift work is going to be possible (and significant reinforcements from CONUS will certainly not arrive fast enough to avoid shift work), or if the unit is going to survive the inevitable losses of key personnel.

Unit Cohesion

Unit cohesion, the extent to which the men of the unit see themselves as a unit or team in which teammates can't let a buddy down, was a crucial determinant of endurance in World War II. It should still hold true.

Worries About Dependents' Care

Worries about dependents' care will play a large role in staying power, if we may generalize from the Israelis' "combat reaction" casualties of 1973. As a working hypothesis relating sleep of leaders, unit cohesion, and concern about dependents to continuous operations, it is likely that endurance is an inverse function of the number of competing loyalties experienced by an individual in time of stress.

Nuclear and Chemical Warfare

Nuclear and chemical warfare may not directly influence survival, but by engendering feelings of helplessness and hindering communication, will also have a significant role in soldiers' will to continue.

RECOMMENDATIONS

A number of recommendations have been made or implied in the course of discussing our data and specifying these conclusions. They are collected here solely for the convenience of the reader, with full knowledge that they are undoubtedly not the only means of extending unit performance, perhaps not even the best means, and that they vary enormously in the level of authority required for their implementation.

1. This report should be disseminated to commanders at all levels.

2. Commanders should emphasize the importance of sleep in sustained operations, orally as well as in writing, by example as well as by decree.

3. "Sleep discipline" should be as much a part of unit evaluations as light or sound discipline.

4. Field exercises, including evaluations, should be of sufficient duration to insure the need for shift work-

ing. Anticipated duration should not be public knowledge.

5. Troops should be made aware of the natural and inevitable low point in morale and performance occurring in all of us between 0200 and 0600 daily, so as to encourage "aiming" at 0600.

6. Commanders should familiarize themselves, and their troops, with the symptoms and cures of neuropsychiatric casualties, which can be expected in quantity, but which if properly managed at the unit level, need not represent permanent losses.

7. Current plans for non-combatant evacuation should be re-evaluated, particularly with regard to the confidence they engender.

8. Provide all soldiers in key communications roles with a standard M17 protective mask, as well as the tanker's M25 model if necessary, to ensure rapid, accurate communications while in position as well as during movements.

9. Increased emphasis on NBC protective measures, especially in regard to measures other than protective masks, and also to operating for extended periods in protective gear.

10. Under conditions of extreme fatigue, post sentries in pairs, even if this means allowing one to sleep, so that visual system dysfunction will not precipitate unnecessary aggressiveness.

11. Consideration should be given to eliminating some of the non-mission requirements currently in force. Alternately, make it possible for the commander to fulfill those requirements en masse instead of one or two soldiers at a time, thereby transforming a nagging drain into an opportunity to further group cohesion.

12. Evaluators at all levels should be given wide latitude and encouragement to insure that the long range goals of training have been attended to as well as the specific "indicators" designed to quantify readiness. Random selection, by the evaluators, of personnel, tasks, vehicles, etc. would be a step in this direction, as would

the use of a large number of personnel from a similar unit as evaluators.

13. Rating commanders on their long-term response to unit deficiencies rather than their mere presence would aid in reducing the adversary nature of evaluations.

14. The teaching responsibilities of senior NCO's, as opposed to administrative or supervisory duties, should be re-emphasized, especially in non-classroom situations such as naturally occurring lulls in field training.

15. Commanders must make it clear to subordinates at all levels that ability to learn from mistakes is what he values, rather than avoiding mistakes at all cost.

16. Consideration should be given to providing some positive immediate incentive for commanding and to eliminating the perception that command is necessary for promotion.

17. Time off should be used more often as reinforcement for rapid competent work. As it is, work slows to meet the required hours.

18. Creation of unit as opposed to personal morale should be given high priority. Special efforts must be made to involve leaders, married soldiers and others living off post, and dependents. Use of "duty hours" for this should be considered a natural consequence of the fact that this is not a troop welfare measure, but a recognition that strong team feelings are an essential component of any combat unit's ability to perform its mission in time of war.

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